

Appendix B

DEP's Method for Defining Watershed Per Acre Phosphorus Allocations

The Department defines per acre phosphorus allocations (P) for lake watersheds and these are presented in Appendix C. The list in Appendix C is not complete, so if a per acre allocation for a town's portion of a lake watershed is needed and it is not listed in Appendix C, request the Division of Watershed Management to provide a per acre allocation for the desired watershed. The Department will continually update Appendix C, both by adding new lakes to the list and by revising allocations for lakes already on the list as new information becomes available. This Appendix describes the process the Department uses to define watershed per acre phosphorus allocations.

Step 1. Defining the Acceptable Increase in Lake Phosphorus Concentration (C)

The first step is to determine how much the lake's phosphorus concentration could be increased without risking a perceivable increase in its ability to support algal production or a decline in its ability to support a healthy, natural fish community. This value, the acceptable increase in lake phosphorus concentration (C), is a function of two variables: the lake's Water Quality Category and the Level of Protection appropriate for the lake. The Department has assigned Water Quality Categories to each lake for which sufficient water quality data is available based on the information in the following table. If insufficient data is available the lake is assigned a default water quality category of Moderate Sensitive.

Lake Water Quality Categories	
Category	Lake Conditions
Outstanding	Exceptional clarity; very low phosphorus and chlorophyll concentrations; low risk of internal recycling from sediments
Good	Average to better than average clarity, phosphorus and chlorophyll; low risk of internal recycling from bottom sediments
Moderate Sensitive	Average clarity, phosphorus and chlorophyll; high potential for internal recycling from the bottom sediments
Poor (Restorable)	Poor clarity; high phosphorus and chlorophyll concentrations; supports blue green algal blooms; good prospects for restoration
Poor (Natural)	Poor clarity; high phosphorus and chlorophyll concentrations; supports blue green algal blooms; poor prospects for restoration because lake is naturally very productive

Step 2. Determine the Allowable Increase in Annual Phosphorus Load

The next step is to determine how much the annual phosphorus load to the lake could be increased without risking an increase in lake phosphorus concentration greater than the acceptable increase (C) defined in Step 1. This is accomplished by multiplying "C" by a lake specific coefficient (F) that estimates the amount of increase in annual phosphorus load to the lake that will result in a 1.0 ppb lake phosphorus concentration. Where a lake has upstream lakes draining to it, "F" represents the direct watershed's (that portion of the total watershed that does not first pass through an upstream lake) share of this load. Where a lake's direct watershed is located in more than one town, "F" reflects the given town's portion of the load. "F" is derived using a steady state solution of Vollenwieder's 1976 phosphorus loading model and is expressed in lbs/ppb/year.

$$\text{Allowable increase in annual phosphorus load} = F \times C \text{ or } FC$$

Step 3. Determine the Per Acres Phosphorus Budget (P)

The next and final step is to determine the per acre phosphorus budget (P, in lbsP/acre/year) by allocating the allowable increase in annual phosphorus load (FC) over the portion of the direct watershed most likely to be developed. This is accomplished by projecting how much of the direct watershed area is likely to be developed (D, in acres) and dividing FC by this acreage.

$$P = FC / D$$

"D" is estimated by:

- Determining the area available for development within the town's share of the direct watershed by subtracting undevelopable acreage (i.e. wetlands, steep slopes, state parks) and already developed land from direct watershed's area.
- Projecting how much of the area available for development will be developed over time based on:
 - o The general growth rate in the town or region
 - o The quality, density and distribution of the road network within the town's share of the direct watershed
 - o Other lake specific, locally identified information